# United States Patent [19]

**Linstromberg**

[11] **4,098,094**

[45] **Jul. 4, 1978**


[54] **STOP MECHANISM FOR MOVABLE ICE RECEPTACLE**


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[73] Assignee: **Whirlpool Corporation,** Benton Harbor, Mich.



[21] Appl. No.: **749,535**

[22] Filed: **Dec. 10, 1976**

[51] **Int. Cl.**[2] ..... **F25C 5/18**

[52] **U.S. Cl.** ..... **62/344;** 312/311

[58] **Field of Search** ..... 62/137, 344; 312/311, 312/274, 271



[56] **References Cited**

U.S. PATENT DOCUMENTS

3,643,464 2/1972 Hilliker et al. ..... 62/344



*Primary Examiner*—William E. Wayner
*Attorney, Agent, or Firm*—Wegner, Stellman, McCord, Wiles & Wood



[57] **ABSTRACT**

A movable ice receptacle for use in a refrigeration apparatus having a refrigerated cabinet defining a space within which the receptacle is normally disposed. The refrigerated space is selectively closed by a door provided with an ice access opening selectively closed by a movable closure. The receptacle is mounted for selective disposition in a rearward ice storage position and a forward ice access position at the opening. The mounting of the receptacle is such that, when the closure is moved to an open position, the receptacle is correspondingly repositioned forwardly from the storage position to the access position. The receptacle is gravity biased toward the forward ice access position, and is urged against this bias by structure associated both with the closure and the receptacle to move the receptacle to the rearward storage position as an incident of the closure being disposed in a closed position. Movement limiting structure is provided for limiting the forward movement of the receptacle to an intermediate position intermediate the ice storage and ice access positions when the main cabinet door is opened. Limited access to the space in the receptacle may be provided at the intermediate position.


**12 Claims, 10 Drawing Figures**

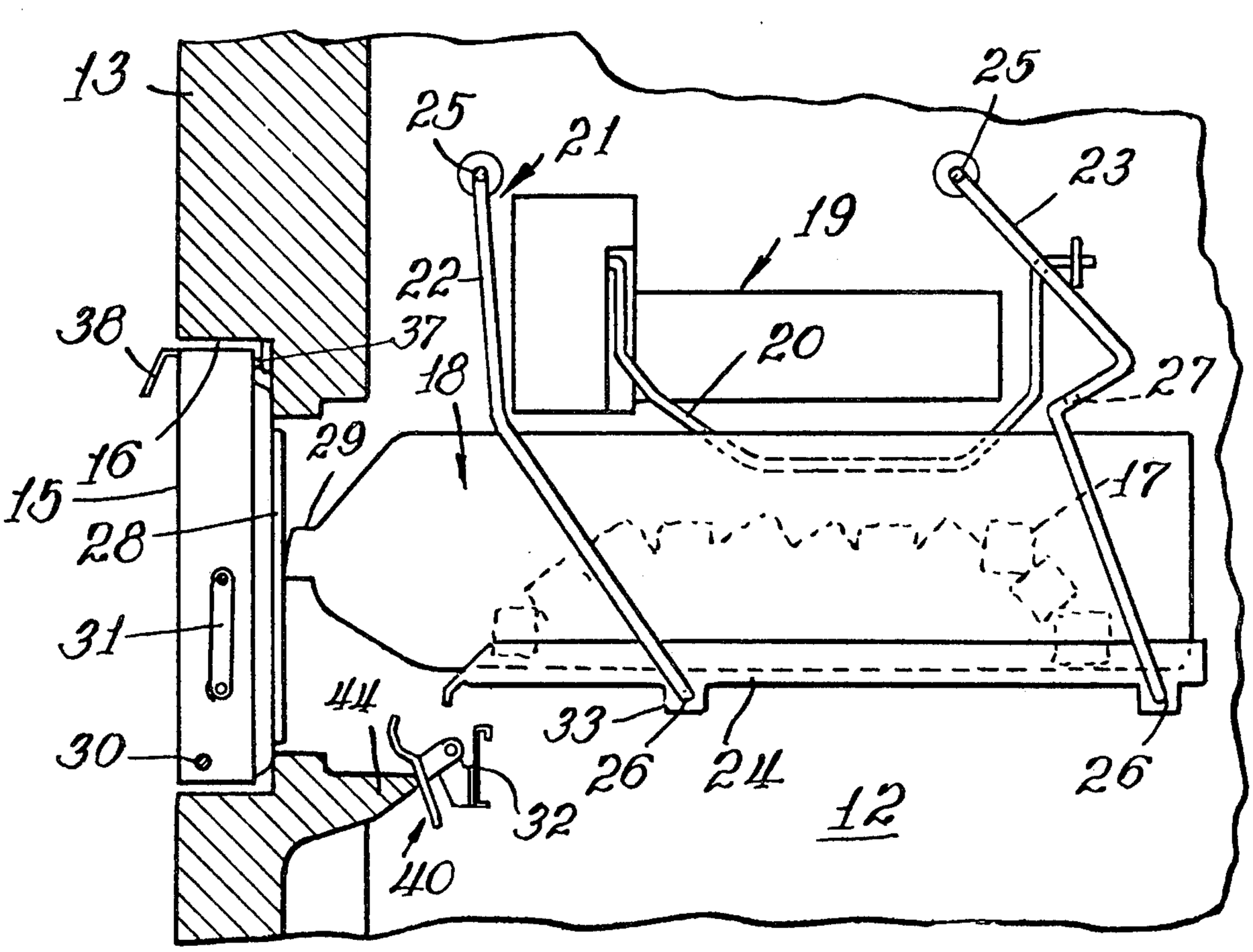


Fig. 1

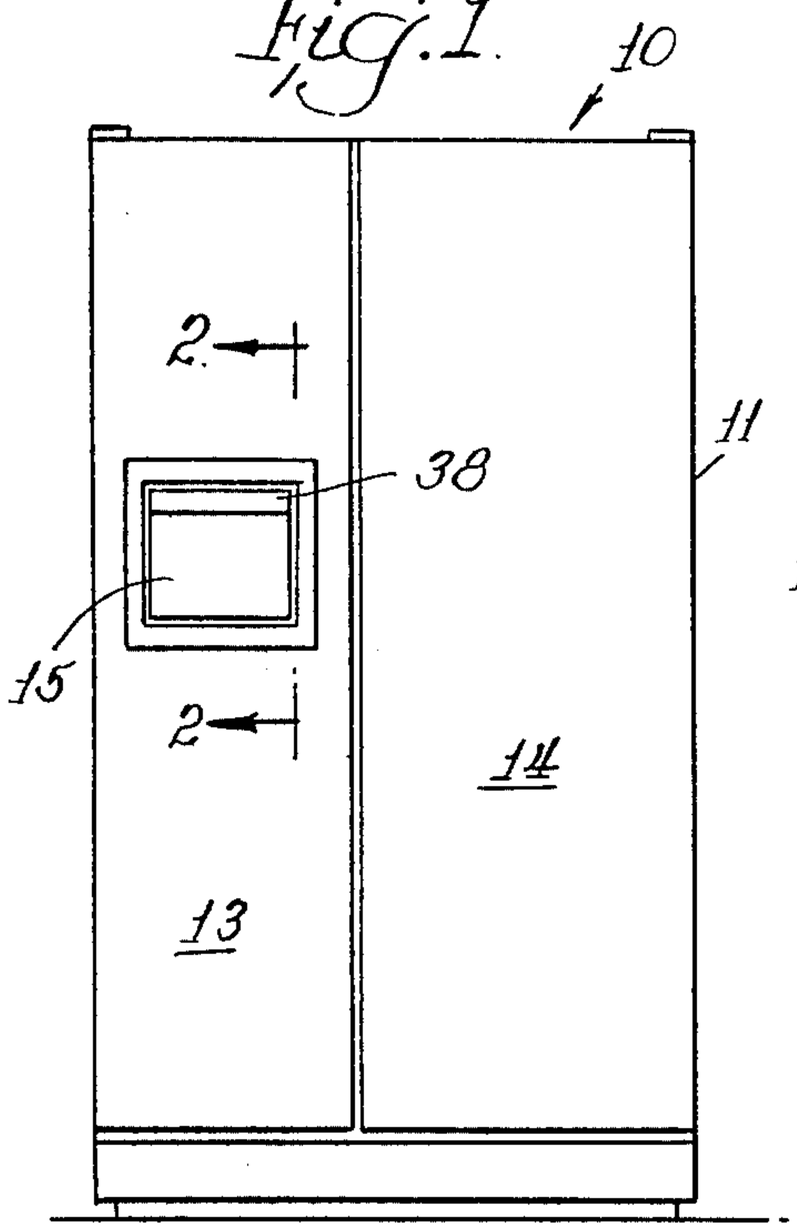



Fig. 2

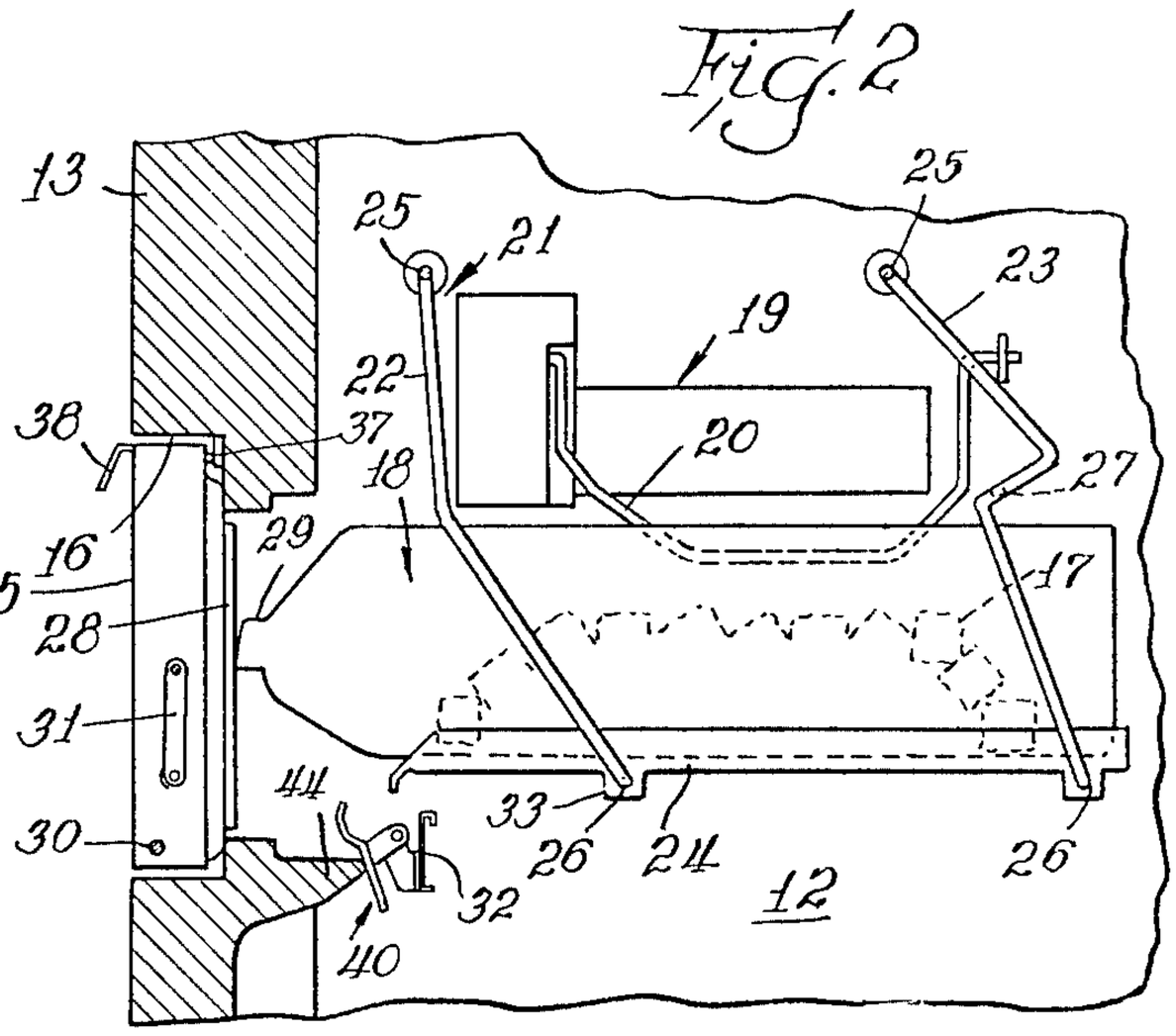



Fig. 3

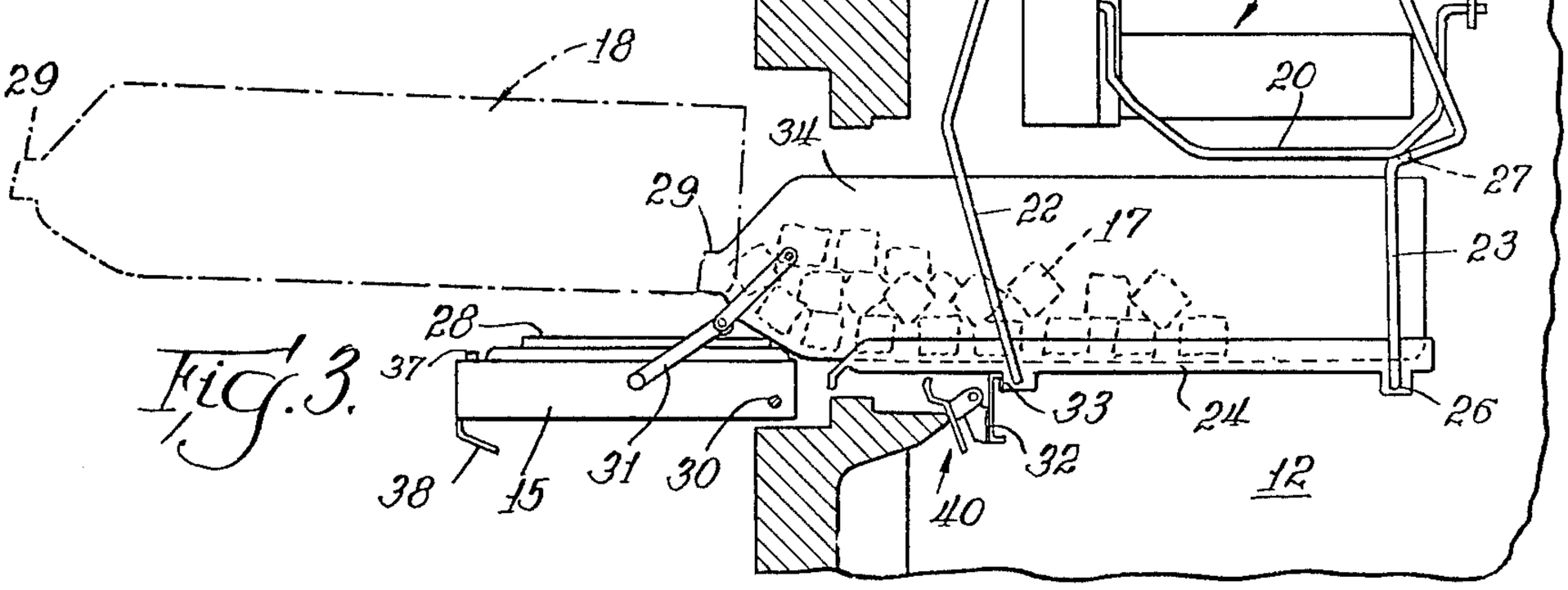
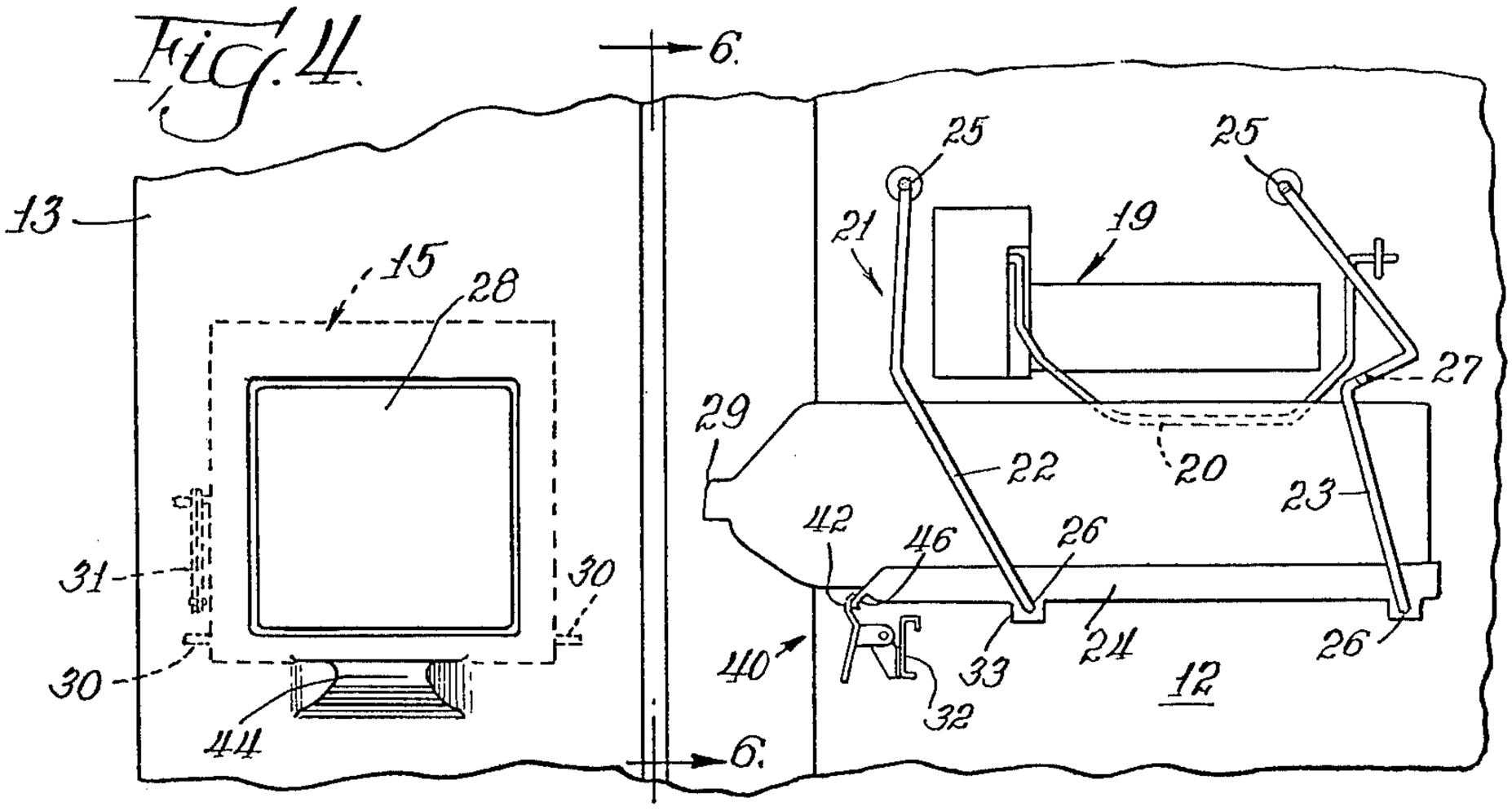



Fig. 4



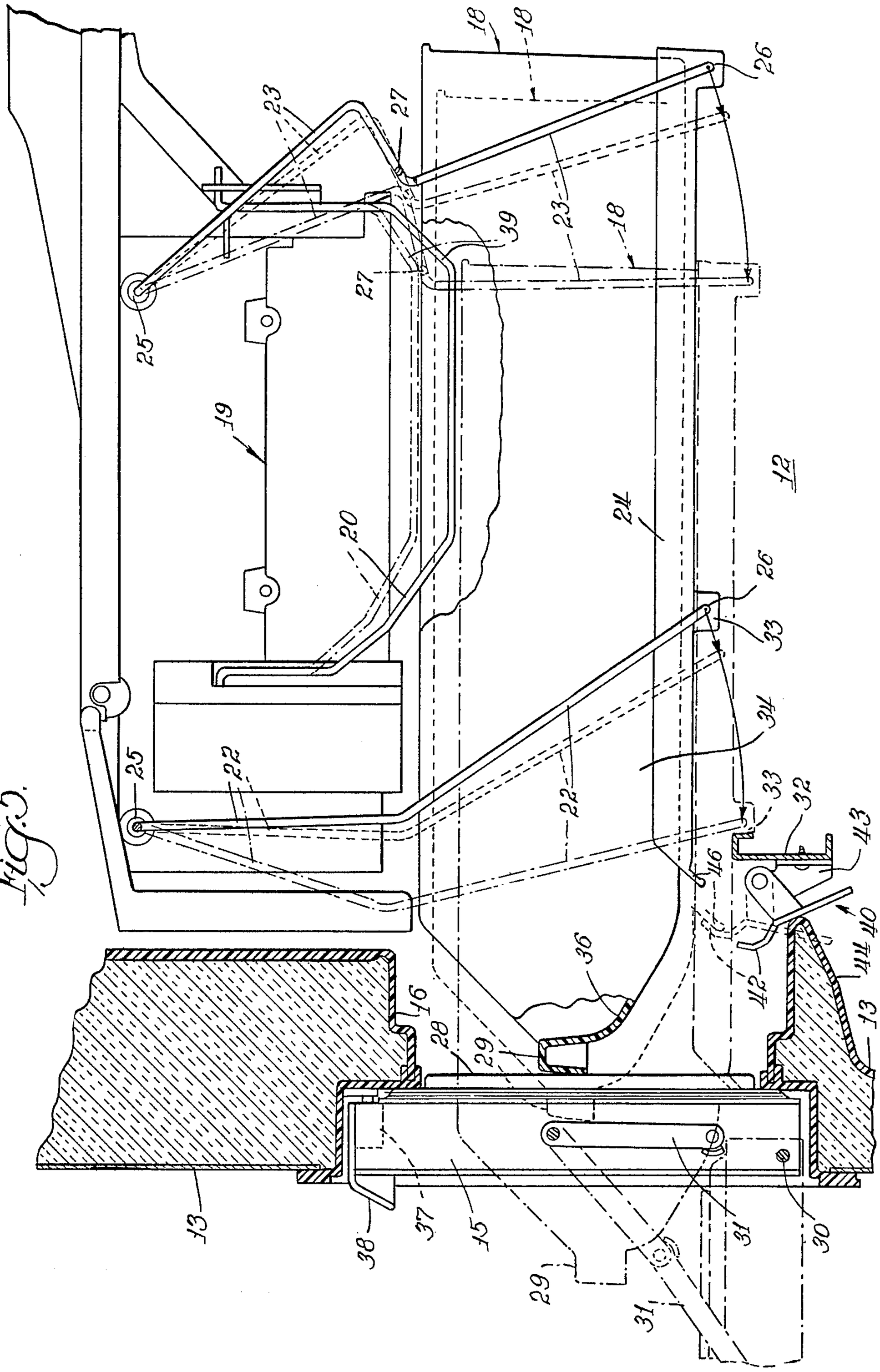

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Fig. 5.

Fig. 6.

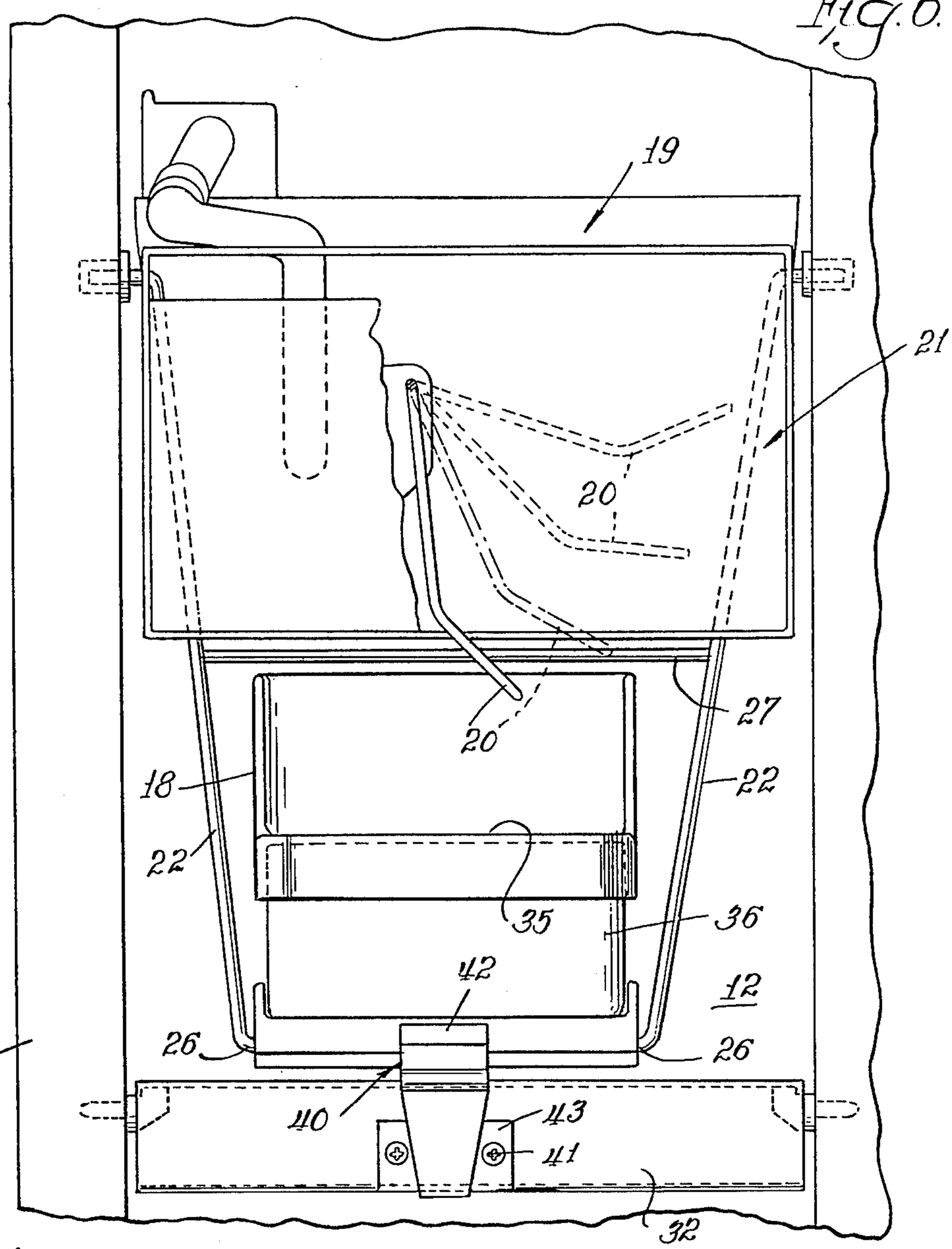



Fig. 7.

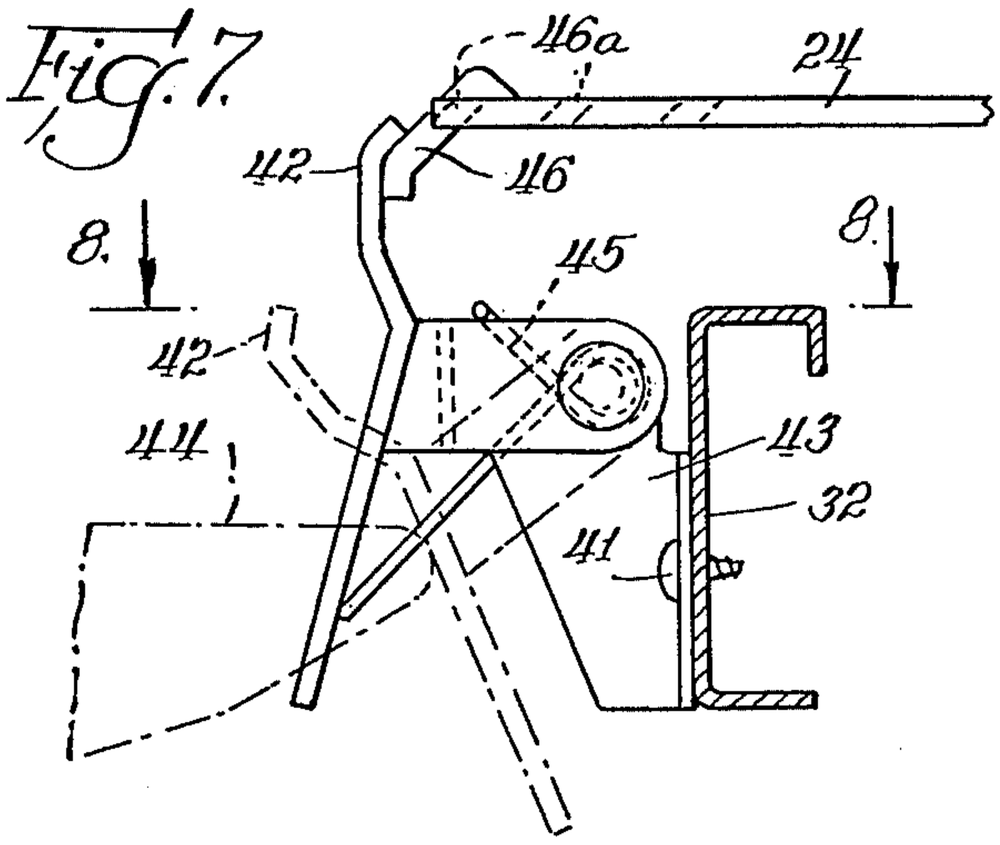
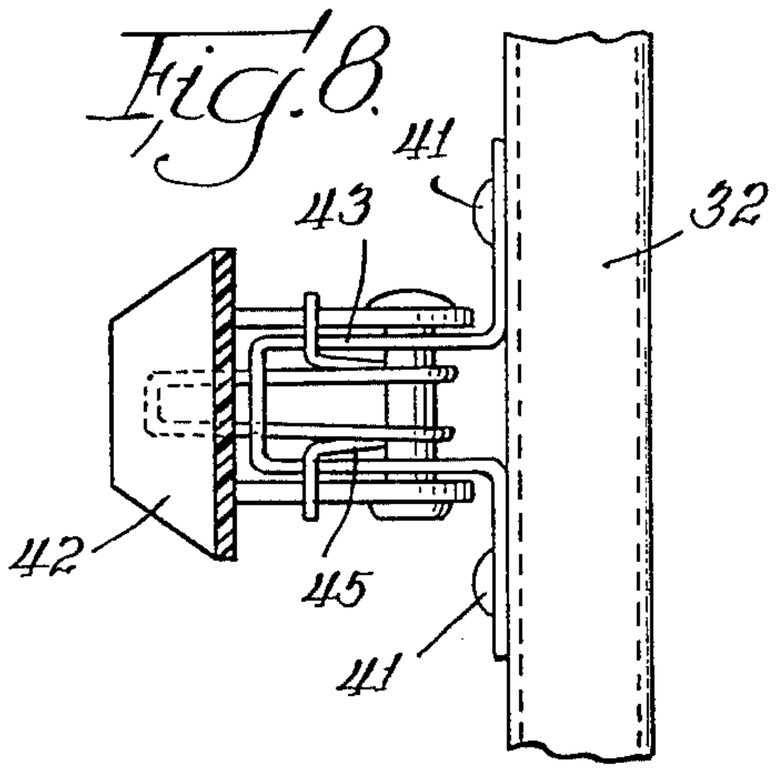



Fig. 8.



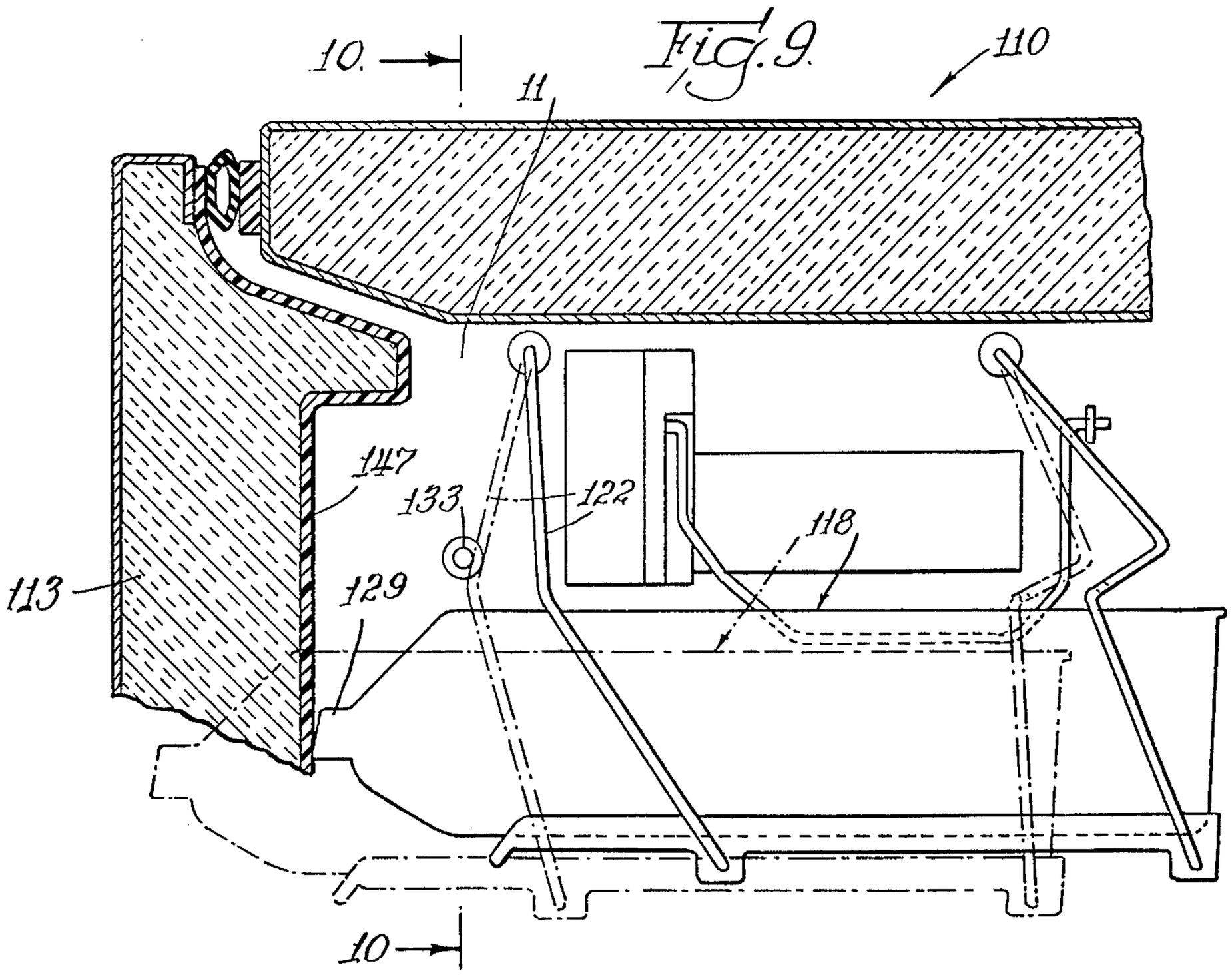



Fig. 9

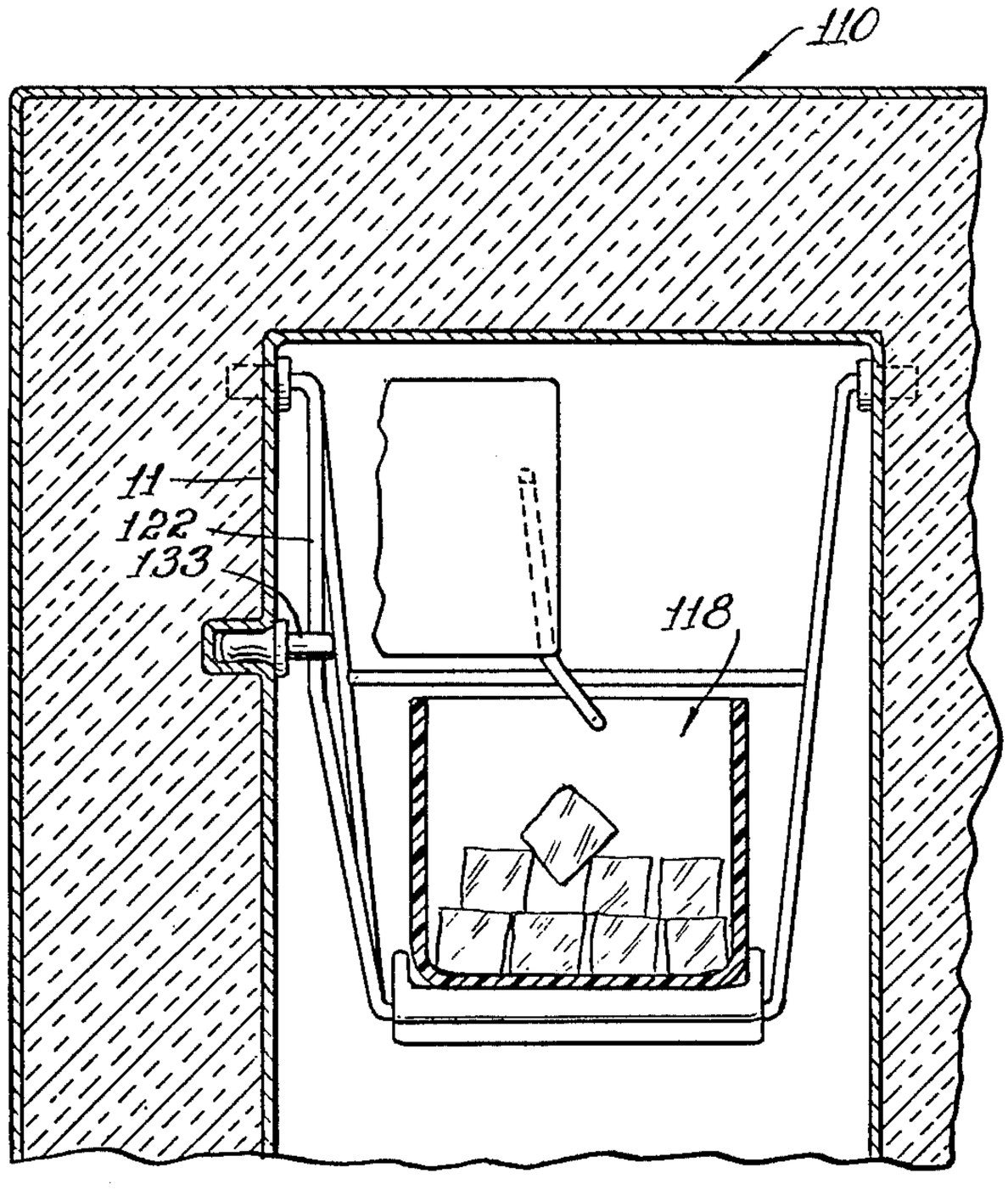



Fig. 10

# STOP MECHANISM FOR MOVABLE ICE RECEPTACLE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to refrigeration apparatus and in particular to means for providing controlled access to collected ice bodies in a refrigerated space defined by the apparatus cabinet.

2. Description of the Prior Art

In U.S. Pat. No. 3,602,007 of Philip J. Drieci, an ice storage receptacle is mounted on a small access door carried by a main freezer door of the refrigerator.

Leo Swerbinsky, in U.S. Pat. No. 3,621,668 shows a refrigerator including an automatic ice maker and a door mounted ice receptacle which receives ice bodies made in the ice maker through a chute extending downwardly into the receptacle when carried on the door.

In U.S. Pat. No. 3,744,270 of Charles A. Wilcox, the ice receptacle includes a front piece effectively forming an additional door to the freezer compartment.

In Donald E. Hilliker et al U.S. Pat. No. 3,643,464, a small secondary door is provided for closing an opening in the main freezer door. As in the Wilcox patent, the secondary door is selectively connected to the ice receptacle so as to cause the receptacle to move forwardly to an acccessible position when the small door is moved to an open position. The connection between the small door and the ice receptacle is broken when the main freezer door is opened. In the access position, the ice receptacle is spaced inwardly of the opening in the main freezer door, thereby limiting access to the receptacle. The receptacle is limited in its forward movement by suitable stops to permit the small access door to be swung away from the receptacle breaking the connection therebetween while yet maintaining the receptacle in the preselected position so that upon return of the small access door, the connection is remade for subsequent control of the movement of the receptacle within the cabinet.

A number of different prior art structures utilizing movable shelves have been developed. Illustratively, Carl Sander, in U.S. Pat. No. 659,105, shows a refrigerator having means for automatically moving a sliding support through the action of opening or closing the door to the compartment.

William Robert Wolf shows in U.S. Pat. No. 924,027 a cabinet having a plurality of shelves suspended on pivotal links with the assembly being swung by the action of the opening and closing of a front door of the cabinet through an interconnecting lever on the door.

Carl H. Hoffstetter et al, in U.S. Pat. No. 1,922,585, show a broiler oven wherein the broiler pan is moved inwardly or outwardly through the broiler oven door opening so as to provide access to the contents of the pan for inspection or other purposes. The broiler pan is carried on swingable arms with the swinging of the structure controlled by a handle at the side of the oven cabinet after the door is opened.

In U.S. Pat. No. 2,375,359 of William T. Hedlund, a spring-biased tray is supported beneath the evaporator. The swinging movement is controlled by a manually operable handle.

Charles L. Liggett, in U.S. Pat. No. 2,667,396, shows a table, or the like, with a normally concealed minor service member which is swingably mounted by suitable struts which, when released, permit the service member to swing downwardly to a hanging access position.



George C. Harbison, in U.S. Pat. No.2,776,866, shows a receptacle mounted to the inside of the refrigerated door on swingable links.

Orson V. Saunders, in U.S. Pat. No. 2,745,259, shows a refrigerator with means to cool shelves adjacent an insulated freezing compartment wherein a small door is hingedly mounted within the cabinet for horizontal swinging movement to normally close the open front of an upper frozen food compartment so as to prevent communication of air between the compartments in the cabinet. An inner panel portion of the door moves away from camming fingers associated with suitable valves to close the valves to prevent loss of refrigeration from the freezing compartment when the door is swung toward an open position.

James W. Jacobs, in U.S. Pat. No. 3,814,492, and Frank Schneller, in U.S. Pat. No. 3,857,623, disclose additional movable shelf structures wherein the shelves are mounted to swingable links.

## SUMMARY OF THE INVENTION

The present invention comprehends an improved means for providing selective positioning of an ice receptacle in a refrigeration apparatus wherein the ice receptacle is automatically moved to a forward access position as an incident of removing a closure from a position wherein it closes an opening in a cabinet door which selectively closes the refrigeration space of a cabinet in which the ice receptacle is disposed.

In the illustrated embodiment, the cabinet door is provided with a small opening which may be selectively closed by the ice access door. The ice receptacle is carried on a mounting means which movably supports the receptacle so as to permit the receptacle to be urged to a rearward ice storage position when both the cabinet door and ice access door are in the closed position.

When the ice access door is opened, the mounting means permits the receptacle to move thereon to an ice access position at the opening in the main cabinet door. At this position, the mounting means engages a stop carried by the cabinet to limit the forward movement of the receptacle to the ice access position.

The present invention comprehends providing a second stop means on the cabinet adapted to limit the forward movement of the receptacle to an intermediate position intermediate the rearward storage position and the forward ice access position. In the intermediate position, limited access to the ice in the receptacle may be had.

The second stop means provided for determining the intermediate position of the ice receptacle comprises a movable stop which may be retracted to permit the receptacle to move to the forwardmost ice access position, as discussed above, when only the small ice access door is open. To effect retraction of the stop, means are provided on the main cabinet door to position the stop in a retracted arrangement.

When, however, the main cabinet door is open such as to provide access to the refrigerated space generally, the means associated with the cabinet door for holding the stop in the retracted position permit the stop now to move into a control position wherein the stop is engaged by suitable shoulder means on the receptacle mounting means to limit the forward movement of the

receptacle from the storage position to the desired intermediate position.

Thus, the invention comprehends an improved means for selectively positioning an ice receptacle in a automatic ice making refrigeration apparatus whereby different ice access dispositions of the receptacle are automatically effected as an incident of opening either the small ice access door in a main compartment door, or opening the main door itself. By providing an intermediate ice access position by opening of the main door, interference with accessibility to the compartment shelf subjacent the ice receptacle is effectively avoided.

The apparatus of the present invention is extremely simple and economical of construction while yet providing the highly desirable features discussed above.

## BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the accompanying description taken in connection with the accompanying drawing wherein:

FIG. **1** is a front elevation of a refrigeration apparatus having improved means embodying the invention for providing access to collected ice bodies therein;

FIG. **2** is a fragmentary enlarged vertical section taken substantially along the line **2—2** of FIG. **1**;

FIG. **3** is a fragmentary vertical section similar to that of FIG. **2** but with the apparatus arranged to provide access to the collected ice bodies in the receptacle, the receptacle being shown in broken lines as removed from the mounting means for further facilitated dispensing of the collected ice bodies therefrom;

FIG. **4** is a fragmentary vertical section illustrating the arrangement of the apparatus with the main freezer door opened;

FIG. **5** is a fragmentary enlarged vertical section showing in greater detail the mounting of the receptacle in a number of different dispositions thereof;

FIG. **6** is a fragmentary front elevation of the apparatus with the freezer door open, as shown in FIG. **4**;

FIG. **7** is a fragmentary enlarged side elevation of the stop means for retaining the receptacle in an intermediate position upon openig of the freezer door;

FIG. **8** is a horizontal section taken substantially along the line **8—8** of FIG. **7**;

FIG. **9** is a fragmentary vertical section illustrating a modified form of apparatus embodying the invention wherein the small access opening closure is eliminated and the receptacle automatically disposed selectively in the storage and access positions as an incident of movement of the main freezer door between closed and open positions;

FIG. **10** is a fragmentary vertical section taken substantially along the line **10—10** of FIG. **9**;

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the exemplary embodiment of the invention as disclosed in FIGS. **1-8** of the drawing, a refrigeration apparatus generally designated **10** is shown to comprise a side-by-side freezer-refrigerator. The cabinet **11** defines a freezer space **12**, which is selectively closed by a front door **13**. A similar door **14** is provided for selectively closing the refrigerator portion of the apparatus. Freezer door **13** may be provided with a small door, or closure, **15** for selectively closing an opening **16** in the main freezer door for providing controlled access to collected ice bodies **17** within a collecting receptacle **18** in freezer space **12**.

In the illustrated embodiment, ice bodies are formed in an automatic ice maker generally designated **19** which may be of conventional construction and provided with a sensing element **20** arranged to extend downwardly into the receptacle **18** to sense the level of ice bodies **17** therein for automatically controlling the operation of the ice maker. The receptacle is carried by mounting means generally designated **21** including a pair of front links **22** and rear links **23** and a lower support **24**. The receptacle may be removably installed on the support for removal from the apparatus for facilitated dispensing of the ice bodies, when desired, as shown in broken lines in FIG. **3**.

Each of the mounting links may be pivotally connected to the cabinet **11** by suitable pivots **25** at their upper ends, and to the support **24** by pivots **26** at their lower ends. Extending transversely between the rear links **23** is a crossbar **27** which is adapted to engage the sensing element **20** when the rear links **23** are moved forwardly from the position of FIG. **2** to the position of FIG. **3** to raise the sensing element sufficiently to prevent further operation of the ice maker **19**.

As illustrated in FIG. **2**, closure **15** includes an inner surface portion **28** adapted to engage a front handle portion **29** on receptacle **18** when the closure is moved to the position of FIG. **2** closing opening **16**. In the illustrated embodiment, the closure **15** is pivotally mounted to the freezer door **13** suitable pivots **30** so as to swing about a horizontal axis from the upright, closed position of FIG. **2**, to a horizontal, open position of FIG. **3**. Pivoted arms **31** may be connected between the door **13** and closure **15** to limit the forward pivoting of the closure to the horizontal position of FIG. **3**.

When closure **15** is moved from the closed position of FIG. **2**, the receptacle **18** swings downwardly on support links **22** and **23** from the storage position of FIG. **2**. The arrangement of the mounting means is such that the receptacle is in an uppermost rearward position in the storage position of FIG. **2** and swings downwardly through an arc having a radius defined by the length of links **22** and **23** to a lowermost position, as seen in FIG. **3**. At this point in the travel of the receptacle, the receptacle is moving with maximum forward velocity.

A stop bar **32** is mounted to the cabinet **11** to extend across the freezer space **12** inwardly of door opening **16**. Receptacle support **24** is provided with a depending shoulder portion **33** carrying pivots **26** and positioned so as to engage stop bar **32** when the receptacle reaches the access position of FIGS. **3** and **5**. The sudden rapid deceleration of the receptacle by the abutment of stop shoulder **33** with stop bar **32** at the time of maximum forward travel speed of the receptacle permits the inertial force of the collected ice bodies **17** therein to urge them toward the front portion **34** of the receptacle. Thus, as shown in FIG. **3**, the collected ice bodies **17** are resultingly disposed within the forward receptacle portion **34** for facilitated access by the user through an upwardly opening recess **35** in the front wall **36** of the receptacle portion **34**.

As the initial arcuate movement of the receptacle starting from the storage position of FIG. **1** includes a substantial downward component, rearward movement of the collected ice bodies during the initial movement is effectively minimized. The inertial movement of the ice bodies due to the rapid deceleration at the access position effectively maximizes the disposition of the collected ice bodies in the readily accessible front portion of the receptacle, as discussed above.

Conversely, as the receptacle **18** is returned to its storage position, its initial movement is essentially totally horizontal, causing a further shift of the collected ice bodies **17** toward the front receptacle portion **34**. Yet, when the receptacle reaches the storage position the horizontal component of motion is substantially reduced, thus minimizing any undesirable rearward shift of the ice bodies.

The relative proportion of vertical versus horizontal movement which the receptacle **18** experiences is a function of the length of the links **22** and **24**, the location of the pivot points **25** and the length of the arc through which the receptacle is permitted to swing. By way of example, a vertical movement of one inch with an accompanying horizontal movement of four inches has been found to provide satisfactory ice access as well as the desired ice shifting function described above.

To ensure that the receptacle **18** remains stationary while in its access position, it is desirable that stop shoulder **33** engage stop bar **32** just before the support **24** reaches what would otherwise be its lowermost position. This biases the stop shoulder into positive engagement with the stop bar, thus minimizing free swinging movement of the support **24** and receptacle **18** as the user withdraws ice bodies.

As shown in FIG. **5**, closure **15** may be provided with a conventional magnetic latch **37** for maintaining the closure in the upright, closed position. The closure may further be provided with a handle **38** for manually swinging the closure between the closed and open positions of FIGS. **2** and **3**.

As illustrated in FIG. **5**, the sensing element **20** includes an angled rear portion **39** adapted to be engaged by the crossbar **27** so as to permit a progressive camming action of the sensing element by the swinging of the receptacle. As shown in FIG. **5**, when the receptacle is in the rearward ice storage position shown in full lines therein, the sensing element extends downwardly into the receptacle with the crossbar **27** spaced rearwardly of the sensing element portion **39**, permitting the sensing element to function in the normal manner in sensing the level of ice bodies in the receptacle for automatically controlling the making of ice bodies by the ice maker **19**. As ice access closure door **15** moves to the open position, the receptacle moves forwardly to the ice access position shown in broken lines in FIG. **5** causing the crossbar **27** to move along camming portion **39** of the sensing element and thereby raise the sensing element to the "Off" position shown in broken lines in FIG. **5**. Concurrently, the swinging of the receptacle downwardly and forwardly from the storage position causes the top of the receptacle to move to below the "On" position of the sensing element shown in full lines in FIG. **5**.

When it is desired to provide access to the entire freezer space **12** rather than merely to the ice receptacle, freezer door **13** may be opened. At such time, it may be desirable to prevent the movement of the receptacle to the projecting ice access position, and for this purpose, a selectively positionable stop **40** is mounted to the stop bar **32** as by suitable screws **41**. The stop includes a shoulder element **42** pivotally mounted to a support **43**. Freezer door **13** includes a rearwardly projecting shoulder portion **44** which engages the shoulder element **42** when the freezer door is in the closed position of FIG. **5** to pivot the shoulder element in a counterclockwise direction to the full line position shown therein (the dotted line position as shown in FIG. **7**). As further shown in FIG. **7**, the shoulder element **42** is biased in a clockwise direction by a suitable spring **45**. The support **24** is provided with a front flange **46** which engages the shoulder element **42** when the shoulder element is pivoted in a clockwise direction to the stop position shown in full lines in FIG. **7**. Such positioning of the shoulder element is effected immediately when the door **13** is moved away from the closed position of FIG. **5** (broken line position of FIG. **7**).

Thus, when the door **13** is in the closed position, shoulder element **42** is positioned to permit the free movement of the receptacle **18** past the element **42** to the ice access position of FIG. **3**. When the door **13** is open, the shoulder element **42** is positioned to be engaged by the receptacle portion **46** at a position of the receptacle only slightly forward of the storage position of FIG. **2**, so that the crossbar **27** remains spaced rearwardly from the sensing element **20** and normal operation of the ice maker may continue. The intermediate position of the ice receptacle is shown in dotted lines in FIG. **5**.

The invention further comprehends other forms of means for bringing the ice receptacle to the ice access position as a function of the door movement. Illustratively, as shown in FIGS. **9** and **10**, a modified form of apparatus generally designated **110** is shown to comprise a refrigeration apparatus wherein the ice receptacle **118** includes a handle portion **129** resting against the inner wall **147** of the freezer door **113** when the freezer door is in the closed position. As freezer door **113** does not include a separate ice access door, access-providing movement of the ice receptacle is effected as an incident of the movement of freezer door **113**. A stop **133** is mounted to the cabinet wall **11** in the path of swinging movement of one of the front links **122** for stopping the forward movement of the assembly at the ice access position illustrated in dotted lines in FIG. **9**.

As shown in FIG. **9**, the movement of the ice receptacle **118** is similar to the movement of the receptacle **18** in apparatus **10** in moving from the storage position to the ice access position.

In each of the embodiments, the movement of the ice receptacle from the storage position commences gradually and in a somewhat downward direction. When the ice receptacle reaches the ice access position, a sudden deceleration is effected tending to shift the ice bodies in the receptacle to the forward ice access position until the access door is closed. The closing of the ice access door effects a repositioning automatically of the ice receptacle to back to the storage position. The movement of the ice receptacle may be caused to be sufficient to move downwardly below the level sensing means of an associated automatic ice maker so as to avoid interference therebetween in the selective positioning of the ice receptacle.

The movement of the ice receptacle is effected by gravity upon release of the receptacle from the storage position as an incident of the opening of the ice access door. The necessary potential energy restoration is effected automatically by the closing of the ice access door.

As will be obvious to those skilled in the art, control of the movement of the ice receptacle may be effected manually by the provision of suitable latches on the cabinet walls in lieu of the control elements of the disclosed embodiments.

The improved refrigeration apparatuses of the disclosed embodiments are extremely simple and economi-

cal of construction. The elimination of connections between the ice receptacle and closure means simplifies the construction and alignment of the ice access assembly, provides a lower cost of assembly, and minimizes maintenance requirements. In addition, the desired movement of the ice receptacle is obtained regardless of whether the ice access door is pivoted about a horizontal axis or a vertical axis.

The disclosed arrangements further assure that the collected ice bodies tend to remain in the forward portion of the receptacle after being urged thereto by the above described movement of the receptacle from the storage position to the ice access position. The movement of the ice receptacle back to the storage position is reversely similar of the movement from the storage position to the ice access position and, thus, the collected ice bodies tend to remain in the forward portion of the receptacle permitting more uniform distribution of the collected ice bodies in the receptacle upon delivery of further ice bodies from the ice maker thereto.

The forgoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

Having described the invention, the embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In a refrigeration appliance having a cabinet defining a freezing space, a freezer door for selectively closing said space and having an ice access opening, a closure for selectively closing said access opening, and a receptacle for storing ice within said space, an improved ice access system comprising:

mounting means for mounting said receptacle for movement between a rearward ice storage position and a forward ice access position, said mounting means mounting said receptacle to move from said ice storage position toward said ice access position as an incident of movement of either of said doors toward their open position; and

movement limiting means for permitting forward movement of said receptacle to a preselected intermediate position intermediate said ice storage position and said ice access position as an incident of opening of said freezer door.

2. The refrigeration appliance structure of claim 1 wherein the movement of the receptacle on said mounting means is biased to said ice access position.

3. The refrigeration appliance structure of claim 1 wherein the movement of the receptacle on said mounting means is gravity biased to said ice access position.

4. The refrigeration appliance structure of claim 1 wherein said movement limiting means comprises stop means and means for disabling said stop means when said freezer door is in its closed position.

5. The refrigeration appliance structure of claim 1 wherein said movement limiting means comprises stop means carried on said cabinet and means carried on said freezer door for disabling said stop means when said freezer door is in its closed position.

6. The refrigeration appliance structure of claim 1 wherein said receptacle is arranged for limited access to ice in the receptacle at said intermediate position.

7. The refrigeration appliance structure of claim 1 wherein said movement limiting means comprises a shoulder portion on said mounting means and a stop means disposed to be engaged by said shoulder element when said receptacle moves toward said ice access position as an incident of movement of the freezer to its open position.

8. In a refrigeration appliance having a cabinet defining a freezing space, and a receptacle for storing ice within said space, first door means for providing controlled access to said space, and second door means for providing controlled access to said space, the improvement comprising:

means for positioning said receptacle in a first, storage position within said space when said door means are arranged to prevent access to said space;

means for positioning said receptacle in a second, access position when said first door means is arranged to provide access to said space; and

means for positioning said receptacle in a third, access position when said second door means is arranged to provide access to said space.

9. The refrigeration appliance structure of claim 8 wherein means are provided for movably carrying said receptacle within said space and each of said positioning means includes a stop for limiting the movement of the receptacle on said carrying means.

10. In a refrigeration appliance having a cabinet defining a freezing space, and a receptacle for storing ice within said space, first door means for providing controlled access to said space, and second door means for providing controlled access to said space, the improvement comprising:

means for positioning said receptacle in a first access position when said first door means is arranged to provide access to said space; and

means for positioning said receptacle in a second access position when said second door means is arranged to provide access to said space, one of said positioning means comprising a movable spring-biased stop means.

11. The refrigeration appliance structure of claim 10 wherein said one positioning means further comprises means on said first door means for disabling said stop means.

12. The refrigeration appliance structure of claim 8 wherein each of said positioning means is carried on said cabinet.

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